

The illustrated valve 4 comprises two interfitting moulded plastics housing members 5 and 6, and an elastomeric flap 7 which in the assembled valve is trapped at one end between the housing members. The upper housing member 5 as viewed in FIG. 2 is also seen from its opposite face in FIG. 3. It has inlet ports 8 passing through it which on the downstream side are surrounded by a seal ridge 9A/9B/9C of generally trapezial planform. The lower housing member 6 as viewed in FIG. 2 is of dished form with a series of outlet ports 10, and snaps onto the member 5 by means of a pair of integral lateral lugs 11 engaging in slots 12 formed in member 5. The flap 7 is of generally trapezial planform sized to fit over the seal ridge and is formed from a thin and highly flexible piece of elastomer, e.g. 0.5 mm thick latex natural rubber having a Shore micro hardness of about 30.

The flap 7 is positioned in the valve by a notch 13 at one end embracing a block 14 on housing member 5, and when the housing members are snapped together that end of the flap becomes trapped between the adjacent portion 9A of the seal ridge and a profiled block 15 upstanding from housing member 6. That is to say it is mounted in the valve in cantilever fashion. In its natural state, if the flap 7 is held horizontally at one end it will tend to bow longitudinally under the force of gravity, i.e. so that its opposite end droops down considerably from the plane of its fixed end. Both the block 15 and the facing portion 9A of seal ridge are, however, curved so as to impart to the flap a transversely arched configuration in the assembled valve, as seen particularly in FIGS. 4 and 5. In the illustrated embodiment this arching is accentuated for the central part of the flap by means of a second profiled block 16 upstanding from the housing member 6 in front of and to a slightly greater height than the block 15, although this is not essential in all embodiments of the invention. The arching of the flap stiffens it sufficiently to prevent it drooping away from any part of the seal ridge under zero pressure differential conditions, whatever the orientation of the valve. The preferred orientation of the valve is in fact with the outlet ports 10 directed with a downward component, as indicated in FIG. 1, so that the user's exhalate will not mist any associated eyewear, and if the user lowers his head the valve may become oriented with the flap 7 lying wholly below the housing member 5.

In use, therefore, the flap 7 seats upon the seal ridge to prevent the passage of any air into the mask through the valve 4 while the user is not exhaling. At the commencement of exhalation, as soon as a minimum "cracking" pressure differential is applied to the flap 7 from the interior of the mask the free end of the flap will lift away from the seal ridge in the sense of the arrow X in FIG. 4, and flexure of the flap will progress rapidly along its length towards the fixed (root) end, to a position determined by the instantaneous rate of flow of exhalate out through ports 8 and 10. When exhalation ceases, the restorative effect of the arched mounting of the flap will cause the flap as a whole rapidly to reseat upon the seal ridge, to minimise the risk of any inward leakage of contaminant through the valve in the period between the end of exhalation and the commencement of inhalation. In particular, the flap 7 does not depend for its closure upon the subsequent application of an inhalatory pressure differential.

From FIG. 3 it will be seen that while the portion 9A of the seal ridge at the root end of the flap has a concave curvature the remainder 9B/9C of the ridge has a flat surface. From FIGS. 3 and 4 it will also be seen that the portion 9C of the seal ridge at the free end of the flap rises further from the plane of the member 5 than does the root end portion 9A,

and the two side portions 9B are straight but inclined as viewed in elevation. The combined effect of this configuration is that the transverse curvature of the flap 7 decreases towards its free end, which lies flat against seal ridge portion 9C, while a degree of longitudinal curvature is also imparted to the central section of the flap (but not to its side edges which lie flat against the ridge portions 9B). This has been found to enhance the stability of the flap in its closed condition while minimising the opening pressure differential for the particular embodiment illustrated. In other embodiments, however, there may be no longitudinal curvature of the flap and/or its transverse curvature may extend throughout its whole length, in the latter case the seal ridge portion 9C being modified to a concave form as indicated in broken line in FIG. 3.

I claim:

1. A uni-directional fluid valve comprising a cantilevered flexible flap and a cooperating valve seat surrounding a valve orifice; the cantilevered flexible flap having a planform defining a root end and a free end at opposite ends of a longitudinal axis of the flap, and two peripheral side edges respectively extending between the root end and the free end; the valve seat having sealing surfaces that contact the flap along said root end, free end and peripheral side edges when the fluid valve is closed; the cantilevered flexible flap is attached to the respective sealing surface of the valve seat at said root end and is freely movable to flex away from the respective sealing surfaces of the valve seat at said free end and along at least portions of said peripheral side edges when fluid flows through the fluid valve and the fluid valve is open; and said root end of the cantilevered flexible flap and the respective sealing surface that contacts the cantilevered flexible flap at said root end have a fixed curvature in a direction transverse to said longitudinal axis, said transverse curvature biases the flap and maintains it substantially in contact with all said sealing surfaces of the valve seat in the absence of an opening pressure differential across the flap, in any orientation of the valve.

2. A valve according to claim 1 wherein the cantilevered flexible flap exhibits said curvature in its natural state.

3. A valve according to claim 1 wherein said curvature is imparted to the cantilevered flexible flap by virtue of its mounting on the valve seat.

4. A valve according to claim 3 wherein the cantilevered flexible flap is trapped at said root end between confronting respectively concave and convex surfaces of first and second structural members, said concave surface comprising a said sealing surface of said valve seat.

5. A valve according to claim 4 wherein said second structural member presents a further surface in contact with a central portion of the cantilevered flexible flap adjacent to said root end to accentuate the curvature thereof.

6. A valve according to claim 1 wherein the respective said sealing surface of the valve seat which the free end of the cantilevered flexible flap contacts is substantially flat.

7. A valve according to claim 1 wherein the respective said sealing surface of the valve seat which the free end of the cantilevered flexible flap contacts is of concave curvature.

8. A valve according to claim 1 wherein the respective said sealing surfaces of the valve seat which the peripheral side edges of the cantilevered flexible flap contact are substantially flat.

9. A valve according to claim 1 wherein the mounting of the cantilevered flexible flap in the valve seat imparts a longitudinal curvature to the central section of the cantilevered flexible flap.

10. A filter mask having an exhalation valve comprising a cantilevered flexible flap and a cooperating valve seat surrounding a valve orifice; the cantilevered flexible flap having a planform defining a root end and a free end at opposite ends of a longitudinal axis of the cantilevered flexible flap, and two peripheral side edges respectively extending between the root end and the free end; the valve seat having sealing surfaces that contact the cantilevered flexible flap along said root end, free end and peripheral side edges when the exhalation valve is closed; the cantilevered flexible flap is attached to the respective sealing surface of the valve seat at said root end and is freely movable to flex away from the respective sealing surfaces of the valve seat at said free end and along at least portions of said peripheral side edges when a user of the filter mask exhales and causes

the exhalation valve to open; and said root end of the cantilevered flexible flap and the respective sealing surface that contacts the cantilevered flexible flap at said root end have a fixed curvature in a direction transverse to said longitudinal axis, said transverse curvature biases the flap and maintains it substantially in contact with all said sealing surfaces of the valve seat in the absence of an exhalatory pressure differential across the flap, in any orientation of the valve.

11. A filter mask according to claim 10 wherein the exhalation valve is so located that during normal head movements of a wearer the cantilevered flexible flap will lie below the valve seat.

* * * * *